PB90-171166

Pesticide Fact Sheet No. 209: Ethion

(U.S.) Environmental Protection Agency, Washington, DC

30 Sep 89

U.S. Department of Commerce
National Technical Information Service
NTIS

50272-101

PB90 171166/AS

REPORT DOCUMENTATION PAGE	1. REPORT NO.	2.	3. Recipient's Accession No. PB90 171166/AS
4. Title and Subtitle: EPA Pesticide Fact Sheets - Ethion No. 209			5. Report Date: September 30, 1989
			6.
7. Author(s): EPA, Office of Pesticide Programs, Registration Division			8. Performing Organization Rept. No. 540/FS-90-075
9. Performing Organization Name and Address: U.S. Environmental Protection Agency, Office of Pesticide Programs, Registration Division (TS-767C), 401 M Street, SW, Washington, D.C. 20460			10. Project/Task/Work Unit No.
			11. Contract(C) or Grant(G) No. (C) (G)
12. Sponsoring Organization Name and Address: Same as #9			13. Type of Report & Period Covered
			14.

15. Supplementary Notes

16. Abstract (Limit: 200 words)

This document contains up-to-date chemical information, including a summary of the Agency's regulatory position and rationale, on a specific pesticide or group of pesticides. A Fact Sheet is issued after one of the the following actions has occurred.

1. Issuance or reissuance of a registration standard,
2. Issuance of each special review document,
3. Registration of a significantly changed use pattern,
4. Registration of a new chemical, or
5. An immediate need for information to resolve controversial issues relating to a specific chemical or use pattern.

17. Document Analysis a. Descriptors

Pesticides, regulations, Chemical Information Fact Sheet, Use Patterns, science findings.

b. Identifiers/Open-Ended Terms

c. COSATI Field/Group

18. Availability Statement: Publicly Available	19. Security Class (This Report): Unclassified	21. No. of Pages: 12
	20. Security Class (This Page): Unclassified	22. Price

(See ANSI-Z39.18) See Instructions on Reverse OPTIONAL FORM 272 (4-77) (Formerly NTIS-35) Department of Commerce

United States
Environmental Protection
Agency

Office of Pesticides and Toxic Substances
Office of Pesticide Programs (H7508C)
Washington, DC 20460

540/FS-90-075

EPA Pesticide Fact Sheet

PB90-171166

Name of Chemical: ETHION

Reason for Issuance: Registration Standard (Second Round Review)

Date Issued: September 30, 1989

Fact Sheet Number: 209

1. DESCRIPTION OF CHEMICAL

Generic (Chemical) Name: 0,0,0',0'-Tetraethyl S,S'-methylene bisphosphorodithioate

Common Name: Ethion

Trade and Other Names: Ethanox, Ethiol, Hylemox, Rhodiacide, Rhodocide, Vegfru Fosmite, RP-Thion, Tafethion.

EPA Pesticide Chemical Code (Shaughnessy No.): 0584401

Chemical Abstracts Service (CAS) Number: 563-12-2

Year of Initial Registration: 1965

Pesticide Type: Insecticide (non-systemic)

Chemical Family: Organothiophosphate member of the Organophosphate Family

U.S. and Foreign Producers:

Cheminova (Denmark)
FMC Agricultural Chemical Group (USA)
M/S Pesticides India (India)
Rallis India Ltd.
Rhone-Poulenc Agrochemic (France)
Sintesul S.A. (Brazil)
Volrho Ltd. (India)

REPRODUCED BY
U.S. DEPARTMENT OF COMMERCE
NATIONAL TECHNICAL INFORMATION SERVICE
SPRINGFIELD, VA. 22161

2. Use Patterns and Formulations

Application: A non-systemic insecticide for control of leaf-feeding insects, mites, and scale.

Registered Uses:

Terrestrial Non-food Crops: Bermudagrass, junipers, ornamental evergreens, pine trees, lawns, ornamental turf, and ornamental plants.

Greenhouse Non-food Crops: Ornamental plants.

Domestic Outdoor Uses: Domestic dwellings, and lawns.

Terrestrial Food Crop Use: Alfalfa (seed crop), almonds, apples, apricots, beans, cherries, chestnuts, corn (field), cotton, cucumbers, eggplants, filberts, grapefruit, grapes, lemons, limes, melons, nectarines, onions (dry & green), oranges, peaches, peanuts, pears, pecans, peppers, pimentos, plums, prunes, sorghum (grain & forage), sorghum (seed crop), squash (summer), strawberries, tangelos, tangerines, tomatoes, and walnuts.

Mode of Insecticidal Activity: Toxic action is exerted by inhibiting enzymes of the nervous system through inhibition of cholinesterase.

Method of Application: Ground and aerial fóliar applications, furrow treatments by ground equipment, and seed treatment.

Annual Usage: 1.2 to 1.5 millon pounds of active ingredient are used in the United States.

Predominant Usage: Citrus accounts for 86% to 89% of the total pounds of ethion used in the United States. The remaining 11% to 14% is applied to cotton and a variety of fruit trees, nut trees, and vegetables. Approximately 55% to 70% of all domestically produced citrus fruits are treated with ethion. Less than 2% of the domestic cotton acreage and fewer than 10% of the fruit (other than citrus), vegetable, and nut acreage is treated with ethion.

Formulations: Emulsifiable solution 500 g/l
Wettable Powder 25%
Dusts 2%,3%,and 4%
Emulsifiable concentrates 4 and 8 lbs/gal
Granules 5% and 10%

3. Science Findings

Chemical Characteristics of Technical Material

Color: colorless to light brown or pale yellow.

Physical state: liquid at room temperature.

Odor: mild dithiophosphate

Melting point: -12°F to -15°F

Boiling point: 164-165°C at 0.3 mm Hg.

Specific gravity: 1.215-1.230 at 20°C

Solubility: Practically insoluble in water; soluble in most organic solvents.

Vapor pressure: 1.5×10^{-6} mm Hg at 25°C

Dissociation constant: Not applicable; TGAI does not disperse in water.

Octanol/water partition coefficient: 10,000 [GC with FPD detector].

pH: 5.1 in an equal volume of distilled water.

Storage stability: 95% of ethion remained unchanged during one year of storage at 25°C. There was <2% deterioration in three years of storage under the same conditions. Recommended shelf life is two years. Do not store below 20°F to avoid crystal formation.

Corrosion: Ethion does not corrode stainless steel or aluminum.

Summary Science Statement

Acute oral toxicity studies show that technical ethion is highly toxic to mammals, particularly to females; [Toxicity Category I (females) and Toxicity Category II (males)]. Ethion has moderately high acute dermal and inhalation toxicities; [Toxicity Category II for dermal toxicity and Toxicity Category II (females) and Toxicity Category III (males) for acute inhalation]. Ethion caused slight redness of the conjunctiva of the eye and slight erythema on the skin. The effects cleared within 48 hours, thus classifying ethion in Toxicity Category IV. Ethion was not found to be a dermal sensitizer and does not cause acute delayed neurotoxicity.

Subchronic toxicity: No compound-related histomorphologic changes were found in a 90-Day Dog Feeding Study. Based upon the inhibition of plasma cholinesterase activity observed, the LEL is 2.5 ppm and the NOEL is 0.5 ppm.

Chronic toxicity: In a chronic toxicity study conducted with rats, a decrease in serum cholinesterase was observed in high dose males and females. No other effects were observed. Based on the cholinesterase inhibition, the systemic NOEL is 4 ppm and the LEL is 40 ppm.

Oncogenicity: Ethion was not found to be carcinogenic in rats and mice.

Teratogenicity: Studies conducted with rabbits and rats did not indicate that there were any structural or functional abnormalities in test animals. However, increases in the incidence of hyperactivity of dams and delayed ossification of pubes in fetuses were observed in the rat study. In the rabbit teratology study, there were increases in the incidence of orange-colored urine, decreases in body weight and food consumption, along with an increased incidence of fused sternal centra in fetuses of treated females. The three generation reproduction study did not show any compound related reproductive effects, a decrease in serum cholinesterase activity.

Mutagenicity: Assays on gene mutation, structural chromosomal aberration, and unscheduled DNA Synthesis indicate ethion is not mutagenic.

Reproduction and Fertility Effects: Ethion has a reproductive NOEL of 25 ppm (HDT) and a systemic NOEL of 25 ppm for males and 4.0 ppm for females. These findings were based on tests in which ethion was administered to groups of F_0, F_1, F_2, male and female rats (15 males/dose and 30 females/dose) at dietary concentrations of 0, 2, 4, and 25 ppm. A decrease in serum cholinesterase activity was observed in the F_1, and F_2 high-dose females (25 ppm).

Gene mutation test: An Ames assay showed that ethion at the concentration range of 0.625 to 10.0 nl/ml does not produce mutagenic effects in five strains of Salmonella typhimurium (TA-98, TA-100, TA-1535, TA-1537, and TA-1538).

Structural chromosome aberration test: An in vivo cytogenetic assay indicated that ethion at dose ranges of 4.7 to 47 mg/kg does not induce chromosome aberrations in rats.

Test for other genotoxic effects: An unscheduled DNA synthesis (USD) in rat primary hepatocytes showed no evidence of induction of UDS at dose levels of 100, 500, 2500, 5,000, and 10,000 ug/plate.

Information on Human Effects:

A group of adult male volunteers (10) was randomly divided into a control group (3 males) and a treatment group (6 males). The treatment group received ethion serially and orally (gelatin capsule) at dose levels of 0.05, 0.075, 0.1, and 0.15 mg/kg. Significant reduction of plasma cholinesterase activity was seen at doses of 0.075 mg/kg and above. Based upon this data a NOEL of 0.05 mg/kg and a LED of 0.075 mg/kg/day were established.

Environmental Characteristics

Environmental Fate: The Agency has determined that ethion appears to be resistant to hydrolysis (except at very alkaline pH), photolyzes in water and on soil (half-life of 58 and 51 days respectively) and its major metabolite is CO_2.

Groundwater: The Agency presently believes that ethion is not expected to leech. Available data indicate that it is immobile and only moderately persistent.

Ecological Characteristics

Aquatic Toxicity: Technical ethion is very highly toxic to freshwater and marine fish. Acute toxicity ranges from an LC_{50} of 49 ppb for Bluegill to an LC_{50} of 720 ppb for Cutthroat trout and flathead minnows.

Ethion appears to be a heavy bioaccumulator (1400 for whole fish on day 42).

Ethion is very highly toxic to freshwater invertebrates. The acute toxicity ranged from 0.056 to 7.7 ppb. The toxicity of ethion to marine/estuarine invertebrates is also very high, ranging from 5.6 ppb to 49 ppb.

Honeybee Acute Toxicity: Ethion was found to be practically non-toxic to honeybees (LD_{50} 20.55 ug/bee).

Endangered Species: Because of the demonstrated toxicity of ethion to nontarget fish and aquatic invertebrates, ethion has been identified by the Office of Endangered Species (OES), U.S. Fish and Wildlife Service (FWS) as being likely to negatively impact on endangered aquatic organisms when applied to certain crops (i.e. citrus, corn, sorghum and cotton). The Agency is developing a program to reduce or eliminate exposure to these vulnerable organisms, and will issue notice of any product labeling, other than those identified in this registration standard, when the program has been developed and implemented.

Worker Protection

Based on the acute hazard to exposed persons, the following interim reentry intervals will be imposed until appropriate exposure data has been evaluated by the Agency:

Crop	Reentry interval from last application
Citrus	30 Days
Peaches	14 Days
Nectarines	14 Days
Grapes	14 Days
All other crops	2 Days

The precautionary and protective clothing label statements listed below are required on all products containing ethion with the signal words DANGER or WARNING that are applied to agricultural sites, structural pest control sites, or greenhouses.

"Do not rub eyes or mouth with hands. If you feel sick in any way STOP work and get help right away. See Practical Treatment Section of this label."

"Do not apply this product in a way that will contact unprotected workers, either directly or though drift. Only protected handlers may be in the area during application."

"USE ONLY WHEN WEARING THE FOLLOWING PROTECTIVE CLOTHING AND EQUIPMENT DURING MIXING/LOADING, APPLICATION, REPAIR AND CLEANING OF MIXING, LOADING, AND APPLICATION EQUIPMENT, DISPOSAL OF THE PESTICIDE, AND EARLY REENTRY INTO TREATED AREAS: Protective suit of one or two pieces covering all parts of the body except head, hands, and feet; chemical resistant gloves; chemical resistant shoes (or chemical resistant shoe covers or chemical resistant boots); and a NIOSH or MSA approved respirator. In addition, mixer/loaders must wear a chemical resistant apron and face shield or goggles.

During equipment repair and cleaning, the respirator need not be worn. During early reentry after sprays have dried or dusts have settled and vapors have dispersed, the respirator need not be worn.

IF MIXING/LOADING IS PERFORMED USING A CLOSED SYSTEM, THE FOLLOWING PROTECTIVE CLOTHING AND EQUIPMENT MAY BE WORN AS AN ALTERNATIVE: long-sleeved shirt and longlegged pants; shoes and socks. Chemical resistant gloves must be available in the cab or cockpit and must be worn when exiting. This clothing is inadequate protection during equipment repair or cleaning, reentry, or pesticide disposal work.

IMPORTANT! If pesticide comes in contact with skin, immediately wash off with soap and water. Always wash hands, face, and arms with soap and water before smoking, eating, drinking, or when using the toilet.

AFTER WORK: Wash gloves with soap and water before removing them. Take off all work cloths and shoes. After removing clothing shower using soap and water, then put on clean clothes. Do not reuse contaminated clothing. Personal clothing worn during work must be laundered separately from household items. Store protective clothing separate from personal clothing. Clean or launder protective clothing after each use. Respirators must be cleaned and filters replaced according to instructions included with the respirator. Protective clothing and equipment that becomes heavily contaminated or drenched must be destroyed according to state and local regulations. HEAVILY CONTAMINATED OR DRENCHED CLOTHING CANNOT BE ADEQUATELY DECONTAMINATED.

DURING AERIAL APPLICATION, HUMAN FLAGGERS MUST BE IN A TOTALLY ENCLOSED VEHICLE."

"Do not enter or allow entry into treated areas until (sprays have dried/dusts have settled/vapors have dispersed, as applicable) to perform hand labor tasks. A person may enter the area to perform other tasks only if the person is wearing the personal protective clothing listed on the label."

"After (sprays have dried/dusts have settled/vapors dispersed, as applicable) do not enter or allow entry into the treated area until the reentry interval has expired, unless the person entering the treated area is wearing the personal protective equipment listed on the label for early reentry."

Tolerance Assessment

Tolerances for ethion in or on raw agricultural commodities and animal products are published in 40 CFR 180.173. Food additive tolerances for ethion have been established for dried tea and raisins and are published in 40 CFR 185.2750 (formerly 21 CFR 193.190). A feed additive tolerance for ethion has been established for dehydrated citrus pulp and is published in 40 CFR 186.2750 (formerly 21 CFR 561.230). All tolerances are expressed in terms of ethion and its oxygen analog (s-[[diethoxyphosphinothioyl)thio)methyl]0,0-diethylphosphorothioate].

Summary of Tolerances Issued for Ethion

Commodities	Tolerances (PPM) US	Canadian	MRL International Mexican	Codex
Almonds	0.1	0.1	0.1	0.1[1]
Almond, hulls	5.0			
Apples	2.0	2	2	2[1]
Apricots	0.1	none	none	0.1[1]
Beans	2.0	1	2	none[2]
Cattle, fat	2.5	2.5	none	
Cattle, meat	2.5	2.5	none	2.5[1]
Cattle, mbyp	1.0	2.5	none	1[1]
Cherries	0.1	none	none	0.1[1]
Chestnuts	0.1	none	0.1	0.1[1]
Citrus	2.0	2	2	2[1]
Citrus, pulp	10			
Corn, fodder	14	none	none	none[2]
Corn, forage	14	none	14	none[2]
Corn, grain	0.1	none	0.1	0.05[3]
Cottonseed	0.5	none	0.5	0.5[1]
Cucumbers	0.5	0.1	0.5	0.5[1]
Eggs	0.2	none	none	0.2[1]
Eggplants	1.0	0.1	1	1[1]
Filberts	0.1	none	0.1	0.1[1]
Goats, fat	0.2	none	none	0.2[1]
Goats, meat	0.2	none	none	0.2[1]
Goats, mbyp	0.2	none	none	0.2[1]
Grapes	2.0	2	2	2[1]
Raisins	4.0			
Hogs, fat	0.2	none	none	0.2[1]
Hogs, meat	0.2	none	none	0.2[1]
Hogs, mbyp	0.2	none	none	0.2[1]
Horses, fat	0.2	none	none	0.2[1]
Horses, meat	0.2	none	none	0.2[1]
Horses, mbyp	0.2	none	none	0.2[1]
Melons	2.0	0.1	2	2[1]
Milk, fat	0.5	none	none	0.2[4]
Nectarines	1.0	none	none	1.0[1]
Onions	1.0	0.1	1	1[1]
Peaches	1.0	1.0	1.0	1.0[1]
Pears	2.0	2	1	2[1]
Pecans	0.1	none	0.1	0.1[1]
Peppers	1.0	0.1	1	1[1]
Pimentos	1.0	0.1	none	none[2]
Plums (fresh prunes)	2.0	1.0		2.0[1]
Poultry, fat	0.2	none	none	0.2[1]
Poultry, meat	0.2	none	none	0.2[1]

Summary of Tolerances Issued for Ethion

Commodities	Tolerances (PPM) US	Canadian	MRL International Mexican	Codex
Poultry, mbyp	0.2	none	none	0.2[1]
Sheep, fat	0.2	none	none	0.2[1]
Sheep, meat	0.2	none	none	0.2[1]
Sheep, mbyp	0.2	none	none	0.2[1]
Sorghum, forage	2.0	none	2.0	none[2]
Sorghum, grain	2.0	none	2.0	none[2]
Squash, summer	0.5	0.1	0.5	0.5[1]
Strawberries	2.0	1.0	2.0	2.0[1]
Tea (dried)	10.0	none	none	5.0[5]
Tomatoes	2.0	0.5	2	2[1]
Walnuts	0.1	none	0.1	0.1[1]

1. Established Codex MRL is numerically identical to U.S. Tolerance.

2. No Codex MRL has been established, therefore, no questions of compatibility exist with respect to Codex MRL.

3. A Codex MRL (CXL) of 0.055 ppm exist for residues of ethion per se in or on maize. This level is lower than that of the U.S..

4. U.S. Tolerance is higher.

5. (Green, black tea): A decision regarding the potential for compatibility between the permanent Codex MRL and the U.S. tolerance will not be made until the adequacy of the U.S. tolerance has been ascertained.

Summary of Dietary Exposure Analysis

The Agency has concluded that the use of ethion will not result in chronic health effects. There does not appear to be a health risk from short term exposure to ethion residue on grapefruit, stone fruits other than peaches and plums, eggs, grains, meat nuts, and poultry. However, based on the limited data/information available, short term exposure to ethion from residues on peaches, vegetables, tea, and oranges may result in acute cholinesterase inhibition for selected TAS populations, infants and children. Also, short term exposure to ethion residues on apples and pears, grapes, melons, tomatoes dry beans, succulent beans, strawberries (pooled with citrus other than oranges and grapefruit), and plums or prunes may result in acute cholinesterase inhibition in all TAS population groups.

The Agency is initiating a Data Call-In to exaimine acute dietary exposure; anticipated residue data are being called in under 40 CFR 158.240 (Reduction of Residue).

SUMMARY OF REGULATORY POSITION

The Agency is considering further regulatory action based on dietary exposure concerns. The Agency has determined that certain current tolerances may not provide an adequate margin of safety in humans. Short term exposure to ethion residues on apples and pears, grapes, melons, tomatoes, dry beans, succulent beans, strawberries (pooled with citrus other than oranges and grapefruit), and plums and prunes may result in acute cholinesterase inhibition for all TAS population groups. The Agency also has determined that short term exposure to ethion residues on peaches, vegetables, tea, and oranges may result in acute cholinesterase inhibition in selected TAS populations, infants and children.

The Agency is not imposing the Restricted Use Classification on all pesticide products containing ethion. At present three ethion products are classified Restricted Use because of their high dermal and inhalation toxicity. Two of these products contain 81.9% active ingredient and the other 81% active ingredient. The Agency will make a decision regarding the Restricted Use Classification on a product-by-product basis for the remaining products after evaluating the product specific toxicity data submitted in response to the Registration Standard issued September 30, 1989.

No groundwater advisory labeling is required because ethion is not expected to leach.

Based on the high acute toxicity and worker poisoning incidents, the Agency is requiring label language stipulating the use of protective clothing and the following reentry intervals.

Citrus	30 Days
Nectarines	14 Days
Peaches	14 Days
Grapes	14 Days
All other crops and uses.	2 Days

The Agency is imposing these reentry intervals as an interim measure until reentry data can be generated.

No significant new food uses or increases of tolerances for food or feed items treated with ethion will be considered until the outstanding residue chemistry studies and residue reduction information have been submitted and reviewed by the Agency.

CONTACT PERSON AT EPA:

Product Specific Inquiries:
William Miller
Product Manager (Team 16)
Insecticide-Rodenticide Branch
Registration Division (H7505C)
Office of Pesticide Programs, EPA
Environmental Protection Agency
401 M Street, S. W.
Washington, DC 20460

Office location and telephone number:
Room 211, Crystal Mall #2
1921 Jefferson Davis Highway
Arlington, VA 22202
(703) 557-2600

Reregistration Document Inquiries:
Richard W. King
Review Manager
Reregistration Branch
Special Review and Reregistration
Division (H-7508C)
Environmental Protection Agency
401 M Street, S.W.
Washington. D.C. 20460

Office location and telephone number:
Room 1120 Crystal Mall #2
1921 Jefferson Davis Highway
Arlington, VA 22202
(703) 557-0304

DISCLAIMER: The information in this Pesticide Fact Sheet is a summary only and is not to be used to satisfy data requirements for pesticide registration and reregistration. The complete Reregistration Document for the pesticide may be obtained from the National Technical Information Service. Contact the Review Manager listed above for further information.